Routing under Uncertainty

van Ee, M.

2017

document version
Publisher's PDF, also known as Version of record

VU UNIVERSITY AMSTERDAM

ROUTING UNDER UNCERTAINTY
APPROXIMATION AND COMPLEXITY

In this thesis, the computational complexity and approximability of several problems in a priori routing and graph search is studied. Specifically, the following results are presented:

- A constant-factor approximation for the a priori traveling repairman problem in the uniform model.
- Hardness and inapproximability results for the a priori traveling salesman problem in the scenario model. Further, constant-factor approximations are provided when the number of scenarios is bounded, when the scenarios are big, and when the scenarios are nested.
- The complexity of the master tour problem is settled. To understand this result, the polynomial hierarchy is briefly discussed.
- Approximability and complexity of the multi-target graph search problem and the Canadian traveler problem. First, a constant-factor approximation for the multi-target graph search problem in the independent decision model is presented. It is also shown that the Canadian traveler problem in the independent decision model is NP-hard on series-parallel graphs. In the scenario model, NP-hardness is shown for disjoint-path graphs and cactus graphs.
- An analysis of the lost cow problem and, in particular, a characterization of distributions for which it is optimal not to turn.
- The graph parameter starwidth is introduced and studied, and its relation with the traveling repairman problem is discussed.

MARTIJN VAN EE

Martijn van Ee (1991) obtained his BSc degree (cum laude) in Econometrics and Operations Research in 2012 at the University of Amsterdam. In 2013, he obtained his MSc degree (cum laude) in Econometrics and Operations Research at the Vrije Universiteit Amsterdam. In January 2014, he started a PhD program in the field of combinatorial optimization under supervision of dr.ir. René Sitters and prof.dr. Leen Stougie. On December 6, 2017, Martijn will defend the results discussed in this thesis. In January 2018, Martijn will start as an assistant professor at the Netherlands Defence Academy.

ISBN-978-90-3610-496-8

ABRI
AMSTERDAM BUSINESS RESEARCH INSTITUTE
WWW.ABRI.VU.NL

23 MARTIJN VAN EE ROUTING UNDER UNCERTAINTY

ROUTING UNDER UNCERTAINTY
APPROXIMATION AND COMPLEXITY

MARTIJN VAN EE